

Some of the World's Best Farmland Is Here

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Soil quality is determined by its properties, characteristics, and conditions. The best soils for field crops are nearly level, loamy, deep, fertile, and have a high available water capacity. The tilling of the tilled layer permits water to enter the soil readily, prevents crusting, and makes tillage easy.

The worst soils for field crops are strongly sloping, clayey, shallow, infertile and have low available-water capacity. Tilling of the surface layer is poor which leads to low infiltration, increased runoff and erosion, crusting, and higher energy requirements to till.

Only 7 percent of the Earth's land surface is suitable for cultivation—the rest is either too hot, too cold, too salty, too steep, or too stony. About 50 percent of the contiguous United States is suitable for cultivation.

Land Classes

The U.S. Department of Agriculture's Land Capability Classification was developed in the 1930's. It groups soils into eight capability classes primarily by their capacity to produce common crops and pasture plants without soil deterioration over a long period.

Class I: Soils with few limitations that restrict use.

Class II: Soils with some limitations that reduce the choice of plants or require moderate conservation practices.

Class III: Soils with severe limitations that reduce the choice of plants or require special conservation practices.

Class IV: Soils with very severe limitations that restrict the choice of plants or require very careful management.

Class V: Soils with little or no erosion hazards but with other limitations such as frequent flooding that restrict their use largely to pasture, rangeland, woodland, or wildlife habitat.

Class VI: Soils with severe limitations that make them generally unsuited to common cultivated crops and restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VII: Soils with very severe limitations that make them unsuited to cultivated crops and restrict their use to pasture or range, woodland, or wildlife habitat.

Class VIII: Soils with limitations that restrict their use to recreation, wildlife, water supply, or to esthetic purposes.



Prime farmland is the best land for producing crops. It has the right combination of physical and chemical properties, soil quality, growing season, and moisture supply. Like this Nebraska farmland, it is flat and available for growing crops. (SCS)



The best soils for field crops are loamy, deep, fertile and have a high water capacity. This soil profile shows a prime farmland soil in Osage County, Kansas. (SCS)

Non-Federal Lands in the Contiguous United States by Land Capability Class

Class	Acres
I	36,030.0
II	290,810.2
III	288,507.5
IV	186,725.8
V	33,657.9
VI	265,096.8
VII	280,779.3
VIII	27,147.5
Total	1,497,655.6

Source: 1982 National Resources Inventory

Using capability class, the broadest category in the classification system, as an indicator of cropland quality, the contiguous United States has more than 615 million acres of land in classes I, II, and III.

Prime Farmland

Prime farmland is yet another indicator of quality. The best land for producing food, feed, fiber, forage, and oilseed crops, prime farmland has the right combination of physical and chemical properties for producing crops. It must also be available as farmland and not under urban development or other construction.

Prime farmland has the soil quality, growing season, and moisture supply¹ needed to economically produce sustained high yields of crops when properly treated and managed.

Soil surveys and land use/cover inventories are used to determine the

location and extent of prime farmland in individual soil survey areas.

Soil Quality Indicators

Crop Yield. Soils support and sustain plants throughout the growing season. Crop yields from different soils are good indicators of quality. Yields of 160 bushels per acre of corn are common on Alpha silt loam, 1–3 percent slopes, but Beta silty clay loam, 2 to 5 percent slopes, in the same field and under the same management, yields only 85 bushels per acre.

Soil properties, husbandry, and other conditions contribute to differences in yields. Productivity-indices (PI) rank soils as to their productivity. PI's summarize the combined effects of major soil properties, characteristics, and conditions that influence yields in a particular region.

Soil Potential. Soil behavior can be improved by modifying the soil or by applying technology that improves its performance for a specific use. Soil potential classes—high, medium, low—express the relative quality of a soil for a particular use compared with other soils in the same area. Soil potential estimates address yield or performance level, the cost of applying technology to compensate for inherent limitations.

Determining Soil Resiliency

Soils vary markedly in their ability to bounce back to a prior condition after being misused or abused. Land

¹Specific criteria are contained in 16 U.S.C. 590a-f, g, i 7CFR 675.5.

Cropland, Pastureland, Rangeland, and Forest Land by Land Subclasses.¹

Land Subclass	Cropland	Pastureland	Rangeland	Forest Land	Total
1,000 acres					
E	214,670	77,955	208,842	171,532	673,999
S	108,348	29,759	22,082	80,765	240,954
W	39,834	17,631	95,748	92,179	245,392
C	23,289	1,026	13,222	612	38,149
Total	386,141	126,371	339,894	345,088	1,197,494

¹Does not include land in capability classes I or V which do not have subclasses.

Source: 1982 National Resources Inventory

Estimated Average Annual Erosion (sheet, rill and wind) in Relation to Tolerance Level (T)

Land Use	≤T	T-2T	>2T	Total
1,000 acres				
Cropland	236,006	88,637	96,760	421,403
Pastureland	121,784	5,589	5,937	133,310
Rangeland	336,386	25,699	43,821	405,906
Forest Land	370,364	9,773	13,577	393,714
Total	1,064,540	129,698	160,095	1,354,333

Source: 1982 National Resources Inventory

subclass, a component of the Land Capability Classification, can be useful in determining resiliency. The subclass is a grouping of soils according to kinds of limitations and hazards associated with use. Four general limitations are erosion (e), root-zone (s), wetness (w), and climate (c).

Erosion. Erosion affects resiliency through the removal of surface soil. Although its impact is not equal for all soils, resiliency is diminished, more

or less, by each erosive event. Deep, friable, loamy soils have perhaps the greatest potential long-time resiliency, whereas shallow, firm, clayey soils are slow to recover. Moreover, their ability to respond may be significantly diminished with each successive loss of top soil.

In an attempt to quantify soil loss and relate it to soil productivity, USDA soil scientists have assigned a soil loss tolerance, T value, for most cultivated

soils. A T value is the maximum rate in tons per acre per year, at which soils can erode and sustain economical crop productivity over a long.

Although a single T value is assigned to each kind of soil, a lower T value may be, and commonly is, assigned to portions of a soil on which erosion has significantly reduced the effective root-zone. Should erosion continue unabated, resiliency would be effectively reduced. Using T value as an indicator of resiliency, those lands exceeding tolerance levels provide a hint of the amount of reduced resiliency caused by erosion.

Resiliency on about 78 percent of all land remains relatively high, since that amount is eroding within tolerable limits. The resiliency of soils in cropland is slowly, but surely, being reduced.

Wet Soils. Wet soils are saturated, flooded, or ponded long enough during the growing season for anaerobic conditions to develop. Nature tends to match these hydric soils with "water-loving" vegetation. The result is wetlands that have their own unique set of characteristics. Our American land includes about 144 million acres of hydric soils. If drastically altered by drainage or by filling in, the ecology of a site is changed from a wetland to another land condition or use.

Fragility. Fragile soils are damaged easily through misuse or abuse. The degree of fragility depends on the soil's nature and properties and on the type and severity of the disturbance sustained.

Soils in hot or cold, and dry climates are in land capability subclass "c." These soils are generally in "equilibrium" with their environment and are very sensitive to induced changes. A good example is the extensive conversion of rangeland to wheat production in the Great Plains during the 1930's drought that resulted in the infamous Dust Bowl. Sudden, dramatic natural changes, such as fire, may so degrade sensitive forest soils and environments that regeneration is unlikely.

The concept of fragility extends to soils that are not in subclass "c." Soils shallow over hard sandstone on gentle slopes are more fragile than deep soils over limestone on gentle slopes. Similarly, shallow soils on steep slopes are more fragile than similar soils on gentle slopes. Fragility is a state of soil being and may be drastically changed over time. Some soils are naturally fragile; some have become fragile from misuse and abuse; others have disappeared leaving bare bedrock exposed.